

*Complete Biological Evolution of the Elm-tree Aphis* (*Tetraneura ulmi*, Aut.). By M. J. LICHTENSTEIN.

For several years past I have communicated to the Academy some new views concerning the biological evolution of the Aphides. These views have been rejected by some entomologists and received with favour by others. Amongst the latter, Prof. Kessler, of Cassel, has done me the honour of placing "Confirmation of the Lichtenstein Theory" as a subtitle to the last observations which he has published on the Aphides of the cornel and apple-tree (*Aphis lanigera*).

Another entomologist, Prof. G. Horvath, Director of the Phylloxera station in Hungary, observed, in the autumn of 1882, that the Aphides which live during the summer at the roots of the maize became winged and repaired to the trunks of the elm trees, upon which they deposited individuals wanting rostra and sexual. Believing, from the nature of the plant attacked, that he had to do with the Aphis of the maize-root (*Pemphigus zee-maydis*, Léon Dufour, according to Lön), he published, in a French entomological Review, the interesting fact which he had observed, concluding thus:—"The *Pemphigus* of the maize-root migrates from its subterranean habitat to the trunks of elm trees; but I do not know what becomes of it afterwards."

On this information I had to try to obtain a counter-proof. As the elm, here as in Hungary, only nourishes one species of *Pemphigus* (*P. pallidus*, Haliday, sub *Eriosoma*), I had no doubt that by taking this species as it emerged from the gall, and forcing it to deposit its eggs upon the maize, I should obtain the subterranean phase observed by Horvath.

I met with complete failure, however; not one of the thousand little *Pemphigi* which I placed upon the maize-roots attached itself. I had, nevertheless, carried on my experiments with the greatest care, by growing the maize in glass vessels, which permitted me to observe with the lens the roots pressed against the transparent sides of the vessel.

I was greatly disappointed; but as I had my arrangements ready, I extended the experiments to the other species which live on the elm: these are four in number—two *Schizoneura*, *ulmi* and *lanuginosa*; two *Tetraneura*, *rubra* and *ulmi*. The first three species died, like the *Pemphigus*, without attaching themselves to the roots of the maize: but, to my great satisfaction, I saw the larvæ of the fourth species, *Tetraneura ulmi*, attach themselves and rapidly increase in size, covering themselves with the woolly or cottony secretion so common among this group of insects. I wrote immediately to M. Horvath, "The counter-proof of your discovery did not succeed with me as regards the *Pemphigus* of the elm. Are you sure that you are not mistaken? Send me the winged insect which migrates from the maize-roots to the elm."

Thanks to the method of preservation which I had invented for the transmission of Aphides in a drop of Canada-balsam, between

two thin slices of mica the size of a postage-stamp, my colleague at Budapest sent me what he believed to be *Pemphigus zee-maydis*. As I thought, he was mistaken; the insect which he discovered on the roots of the maize is a *Tetraneura*, since the hind wings have only one nervure instead of two, as the species of the genus *Pemphigus* should have. Moreover, the size, shape of the antennæ, and absence of hairs on the abdomen proved that it was *Tetraneura ulmi* and not *Tetraneura rubra*, of which I had discovered the subterranean habitat in the preceding year, and which lives at the roots of the dog's grass.

Here, then, we have the complete history of the biological evolution of a second Aphis of the elm, discovered, so to speak, simultaneously in France and Hungary, and which had already been elucidated by Prof. Kessler, of Cassel, placed now beyond doubt. In the train of *Phylloxera quercus*, *Anopleura lentisci*, and *Tetraneura rubra*, of which I made known the migrations from one species of oak to another, or from the roots of grasses to the mastie-tree and the elm, we have *Tetraneura ulmi*, which migrates in June from the elm-galls to the roots of the maize, and which returns in October in the pupiferous form, bringing forth the sexual individuals upon the trunks of the elms.

As to *Pemphigus zee-maydis*, its gallicolous form (that is to say, the foundress and emigrant phases) still remains to be discovered.—*Comptes Rendus*, July 16, 1883.

*Elevated Coral Reefs of Cuba.* By W. O. CROSBY\*.

Mr. Crosby describes in this paper the elevated coral reefs of Cuba, and draws from them the apparently well-sustained conclusion that they indicate a slow subsidence during their formation, and hence, further, that Darwin's theory of the origin of coral islands is the true theory. The *lowest* reef-terrace of the northern side of the island has a height of 30 feet, and varies in width from a few rods to a mile; it was once plainly the fringing reef of the shore. The *second* reef-terrace rises abruptly from the level of the lower to a height of from 200 to 250 feet, and bears evidence of having been of like origin with the lower. The altitude of the *third* reef is about 500 feet; and the *fourth* has a height east of Baracoa, near the Yunuri River, "of probably not less than 800 feet." These old reef-terraces extend, "with slight interruptions, around the entire coast of Cuba; and in the western part of the island, where the erosion is less rapid than further east, they are the predominant formation, and they are well preserved on the summits of the highest hills. Mr. Alexander Agassiz states that the hills about Havana and Matanzas, which reach a height of over 200 feet, are entirely composed of reef-limestone."

\* Proc. Boston Soc. Nat. Hist.